REMARKS

Claims 1–8 and 21–32 are pending in the present application.

Claim 1 was amended solely to correct a typographical error.

Reconsideration of the claims is respectfully requested.

35 U.S.C. § 103 (Obviousness)

Claims 1–8, 21–25 and 29–31 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,307,258 to *Crane, Jr. et al* in view of U.S. Patent No. 6,165,818 to *Ichikawa et al*. This rejection is respectfully traversed.

In *ex parte* examination of patent applications, the Patent Office bears the burden of establishing a *prima facie* case of obviousness. MPEP § 2142; *In re Fritch*, 972 F.2d 1260, 1262, 23 U.S.P.Q.2d 1780, 1783 (Fed. Cir. 1992). The initial burden of establishing a *prima facie* basis to deny patentability to a claimed invention is always upon the Patent Office. MPEP § 2142; *In re Oetiker*, 977 F.2d 1443, 1445, 24 U.S.P.Q.2d 1443, 1444 (Fed. Cir. 1992); *In re Piasecki*, 745 F.2d 1468, 1472, 223 U.S.P.Q. 785, 788 (Fed. Cir. 1984). Only when a *prima facie* case of obviousness is established does the burden shift to the applicant to produce evidence of nonobviousness. MPEP § 2142; *In re Oetiker*, 977 F.2d 1443, 1445, 24 U.S.P.Q.2d 1443, 1444 (Fed. Cir. 1992); *In re Rijckaert*, 9 F.3d 1531, 1532, 28 U.S.P.Q.2d 1955, 1956 (Fed. Cir. 1993). If the Patent Office does not produce a *prima facie* case of unpatentability, then without more the applicant is entitled to grant of a patent. *In re Oetiker*, 977 F.2d 1443, 1445, 24 U.S.P.Q.2d

1443, 1444 (Fed. Cir. 1992); *In re Grabiak*, 769 F.2d 729, 733, 226 U.S.P.Q. 870, 873 (Fed. Cir. 1985).

A *prima facie* case of obviousness is established when the teachings of the prior art itself suggest the claimed subject matter to a person of ordinary skill in the art. *In re Bell*, 991 F.2d 781, 783, 26 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1993). To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed invention and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. MPEP § 2142.

Independent claims 1, 21 and 29 recite, directly or indirectly, mounting an integrated circuit die on a lead frame. A lead frame, as that term is employed in the specification and under the ordinary meaning of the term with the relevant art, is a structure, generally stamped from a metallic sheet, typically comprising a die paddle on which an integrated circuit die is mounted and lead portions extending outwardly therefrom to project from the packaged integrated circuit after plastic or epoxy encapsulation of the integrated circuit die, die paddle,

and part of each lead portion. The packaged integrated circuit leads are integrally formed from the lead frame.

Crane, Jr. et al teaches a housing 200 including separately formed insulative, polymeric sidewalls 210 and end plate 220 and (optionally conductive) cover plate 400:

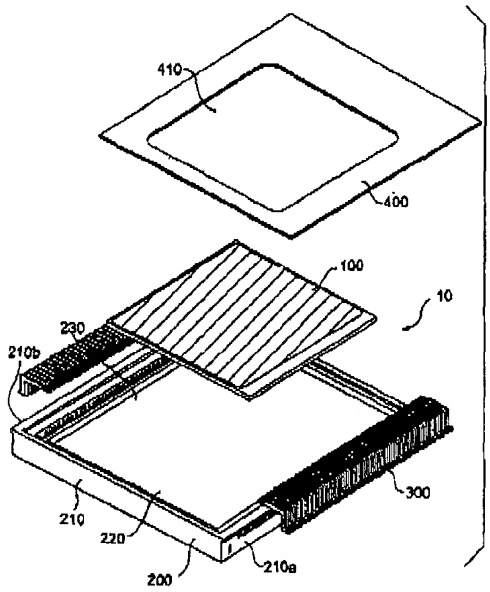

FIG. 1

Crane, Jr. et al, Figure 1. Leads 300 are separately formed from sidewalls 210 and end plate 220:

> FIGS. 1 and 2 illustrate one embodiment of a semiconductor die package 10 for holding a semiconductor die according to the present invention. FIG. 1 provides an exploded view of the semiconductor die package and semiconductor die shown in FIG. 2. As shown in FIGS. 1 and 2, semiconductor die package 10

> includes a housing 200 for holding one or more semiconductor dies 100, leads 300 retained in the housing 200, and a cover plate 400 disposed at the top of the housing 200.
>
> The housing 200 includes a plurality of side walls 210 and an end plate 220. As shown in FIGS. 1 and 2, leads 300 extend from the side walls 210 of housing 200. While FIG. 2 shows a single row of leads 300 extending from opposite side walls 210a and 210b of housing 200, the leads 300 may extend from any one or more of the side walls 210 and may extend from the side wall(s) 210 in one or more rows.

Crane, Jr. et al, column 3, lines 56 through column 4, line 4. The sidewalls 210 and end plate 220 of housing 200 and leads 300 of *Crane, Jr. et al* therefore do not constitute a lead frame. *Crane, Jr. et al* is not analogous to the claimed invention (or to the teachings of *Ichikawa et al*, described below).

Ichikawa et al discloses a lead frame 41 on which a "pellet" (an integrated circuit die) is mounted. *Ichikawa et al*, Figure 4, column 6, line 45 through column 7, line 25.

Independent claims 1, 21 and 29 also recite partially encapsulating at least part of the integrated circuit die and a portion of the leads. *Crane, Jr. et al* does not disclose a lead frame. *Crane, Jr. et al* teaches encapsulating portions of an integrated circuit die 100 and conductive material connecting the die 100 to leads 300. *Crane, Jr. et al*, column 4, lines 25–27. However, *Crane, Jr. et al* does not disclose encapsulating a portion of a lead frame.

Ichikawa et al discloses encapsulating the pellet mounted on a lead frame 41 and a portion of lead frame 41. *Ichikawa et al*, Figure 7, column 7, lines 27–39.

Independent claims 1, 21 and 29 each recite folding unencapsulated portions of the lead frame around the sides of the encapsulated integrated circuit die and over or adjacent to a peripheral upper surface of the plastic or epoxy encapsulating material. Such a feature is not shown or suggested by the cited references. *Crane, Jr. et al* teaches forming a cover plate 400 received by housing 200 over an encapsulated integrated circuit, where the cover plate 400 has an opening 410 therethrough for a fingerprint sensor and is optionally formed of conductive material to discharge static from a person's finger. *Crane, Jr. et al*, column 7, lines 25–45. However, *Crane, Jr. et al* does not teach or suggest wrapping a portion of a lead frame around an encapsulated integrated circuit die. *Ichikawa et al* also does not teach or suggest wrapping a portion of the lead frame around an encapsulated integrated circuit die.

The combined references fail to provide a motivation or incentive for modifying the respective teachings to achieve the claimed invention. The mere use of conventional lead frame technology in *Ichikawa et al* does not provide a motivation or incentive for employing such technology to achieve a structure having conductive electrostatic discharge protection over a fingerprint sensor. The use of a separate conductive cover plate to provide electrostatic discharge protection over a fingerprint sensor in *Crane, Jr. et al* does not provide a motivation or incentive to achieve similar results specifically using lead frame technology.

The combined references also fail to provide a reasonable expectation of success in achieving the claimed invention. Neither reference contains any teaching or suggestion that the

respective packaging processes may be successfully combined. Neither reference contains any basis for expecting that the conventional lead frame technology employed in *Ichikawa et al* could be successfully modified to achieve the results produced by using a separate cover plate in *Crane, Jr. et al*. A general incentive (achieving a structure including an electrostatic discharge ring proximate to a sensing surface of a fingerprint sensor) does not render obvious a specific result (forming the electrostatic discharge ring from portions of a lead frame folded around sides of an encapsulated integrated circuit die mounted on the lead frame).

Crane, Jr. et al teaches a similar structure, but one formed by a very different method. *Ichikawa et al* relates to similar packaging processes, but without any suggestion that the processes could be successfully modified to achieve a structure similar to that produced in *Crane, Jr. et al*, or the specific claimed invention of forming the ESD protection integral with the lead frame and folding that ESD protection lead frame portion around the encapsulated integrated circuit. The references therefore fail to present a *prima facie* case of obviousness.

Claim 2 recites grounding the electrostatic discharge protection portion of the lead frame which is folded around the encapsulated integrated circuit die. Such a feature is not shown or suggested by the cited references. *Crane, Jr. et al* does not teach or suggest use of a lead frame, or folding of a lead frame around an encapsulated portion of an integrated circuit. *Crane, Jr. et al* does suggests alternatively either grounding of some of leads 300 or connection of some leads 300 to optional ESD shielding:

> Not all of the leads 300 need to be electrically connected to the semiconductor die. Some of leads 300 may not be connected to any electrically conductive element within the housing 200. Alternatively or in addition, some of leads 300 may be electrically connected to electromagnetic interference (EMI) or electrostatic discharge (ESD) shielding either internal or external to the housing 200, a ground or power plane included within the housing 200, or another electrical component within the housing.

Crane, Jr. et al, column 4, lines 15–24. However, *Crane, Jr. et al* does not teach or suggest grounded the cover plate 400, or connecting the cover plate 400 to a grounded lead 300. *Ishikawa et al* similarly teaches grounding leads, but does not teach or suggest folding a portion of the lead frame around the encapsulated integrated circuit pellet to a location over or adjacent to a peripheral upper surface of the pellet, or grounding the portion folded around the encapsulated pellet.

Claim 3 recites encapsulating exposed surfaces of an integrated circuit die mounted on a lead frame except for a sensing surface. Such a feature is not shown or suggested by the cited references. *Crane, Jr. et al* does not teach or suggest using a lead frame in packaging a sensor circuit. *Ichikawa et al* does not teach or suggest encapsulating less than all of the pellet mounted on the lead frame. The references, taken alone or in combination, provide no motivation or incentive for combining the respective teachings to achieve the claimed invention, and no reasonable expectation of success that the respective teachings could be successfully combined to achieve the claimed invention.

Claim 4 recites folding portions around each side of the encapsulated integrated circuit die. Such a feature is not shown or suggested by the cited references. *Crane, Jr. et al* does not teach or suggest using lead frames, folding a portion of any structure around the integrated circuit, or specifically folding a portion of any structure around all sides of the integrated circuit. *Ichikawa et al* does not teach or suggest folding portions of the lead frame around each side of the integrated circuit.

Claim 5 recites folding a portion of the lead frame around one side of the encapsulated integrated circuit die, with the folded portion having an opening therein providing access to a connector to pins electrically connected to the integrated circuit die. Such a feature is not shown or suggested by the cited references. *Crane, Jr. et al* does not teach or suggest using a lead frame, but instead teaches uses separate pieces to form housing 200. *Crane, Jr. et al* teaches forming sidewalls 220 with openings for individual leads 300, but does not teach leaving an opening therethrough for a connector. Moreover the references, taken alone or in combination, fail to provide a motivation or incentive for modifying the respective teachings to (a) form the lead frame of *Ichikawa et al* integrally with structures equivalent to sidewalls 220, or (b) to form such integral structures with openings providing access for a connector (as opposed to passage of a portion of leads 300).

Claim 6 recites that the folding of lead frame portions around the encapsulated integrated circuit does not include edges of the lead frame including electrical leads for the integrated

circuit. Such a feature is not shown or suggested by the cited references. Neither reference teaches selecting only edges of a lead frame not including leads for folding around the encapsulated die to form an ESD protection ring.

Claims 7 and 30 recite that folding of the lead frame includes folding of a first portion around a side of the encapsulated integrated circuit die, and a second portion extending from the first portion over a peripheral upper surface of the encapsulated integrated circuit die. Such a feature is not shown or suggested by the cited references. *Crane, Jr. et al* teaches separate sidewall and cover plate portions; *Ichikawa et al* does not teach folding anything except leads, and not around the side and over a peripheral upper surface of the encapsulated integrated circuit die.

Claims 8 and 31 recite that folding of the lead frame includes folding of a first portion around a side of the encapsulated integrated circuit die, and a second portion extending from the first portion adjacent to and level with a peripheral upper surface of the encapsulated integrated circuit die. Such a feature is not shown or suggested by the cited references. *Crane, Jr. et al* teaches separate sidewall and cover plate portions; *Ichikawa et al* does not teach folding anything except leads, and not around the side and adjacent to and level with a peripheral upper surface of the encapsulated integrated circuit die.

Claim 22 recites encapsulating only the integrated circuit die and the portion of the lead frame on which the integrated circuit die is mounted, leaving the remaining portions, including

the surface of the lead frame portion opposite that on which the integrated circuit die is mounted, unencapsulated. Such a feature is not shown or suggested by the cited references. *Crane, Jr. et al* does not relate to lead frames. *Ichikawa et al* does not teach or suggest encapsulating only one side of a lead frame portion on which the pellet is mounted. The references, taken alone or in combination, provide neither (1) motivation or incentive for forming the structure of *Crane, Jr. et al* using lead frame-based packaging or modifying the lead frame packaging process of *Ichikawa et al* to leave one surface of the lead frame portion on which the pellet is mounted unencapsulated, nor (2) a reasonable expectation of success that the respective teachings could be combined to achieve the claimed invention.

Claim 24 recites mounting the integrated circuit die on a flat lead frame including leads projecting from at least one edge and an electrostatic discharge protection portion projecting from at least one edge. Such a feature is not shown or suggested by the cited references. *Crane, Jr. et al* does not relate to lead frames. *Ichikawa et al* does not teach or suggest an electrostatic discharge portion projecting from one edge of a lead frame. The references, taken alone or in combination, provide no motivation for modifying the lead frame in *Ichikawa et al* to include an electrostatic discharge portion projecting from an edge thereof (recall that sidewalls 220 in *Crane, Jr. et al* are insulative, while leads 300 and cover portion 400 are separate), nor any reasonable expectation that such modification could be successfully achieved.

Claim 25 recites that the electrostatic discharge portion extends from an edge of the lead frame other than an edge from which the leads project. Such a feature is not shown or suggested by the cited references. *Crane, Jr. et al* does not relate to lead frames. *Ichikawa et al* does not teach or suggest an electrostatic discharge portion projecting from any edge of a lead frame, much less an edge other than that from which the leads project. The references, taken alone or in combination, provide no motivation for modifying the lead frame in *Ichikawa et al* to include an electrostatic discharge portion projecting from an edge thereof other than the edge from which the leads project (recall that sidewalls 220 in *Crane, Jr. et al* are insulative, while leads 300 and cover portion 400 are separate), nor any reasonable expectation that such modification could be successfully achieved.

Therefore, the rejection of claims 1–8, 21–25 and 29–31 under 35 U.S.C. § 103 has been overcome.

AMENDMENTS WITH MARKINGS TO SHOW CHANGES MADE

Claim 1 was amended herein as follows:

1. (twice amended) A method of providing electrostatic discharge protection for an integrated circuit, comprising:

mounting an integrated circuit die on a lead frame;

encapsulating at least part of the integrated circuit die and a portion of the lead frame with a plastic or epoxy material; and

folding an [unecapsulated]unencapsulated portion of the lead frame around sides of the encapsulated integrated circuit die and over or adjacent to a peripheral upper surface of the plastic or epoxy material.

If any issues arise, or if the Examiner has any suggestions for expediting allowance of this Application, the Applicant respectfully invites the Examiner to contact the undersigned at the telephone number indicated below or at ***dvenglarik@davismunck.com***.

The Commissioner is hereby authorized to charge any additional fees connected with this communication or credit any overpayment to Deposit Account No. 50-0208.

Respectfully submitted,

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Date: 10-14-02

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